



PROJECT PIPELINE

**BR-23-08: SCOTT COUNTY
US 58 (BRISTOL HIGHWAY) FROM WADLOW GAP
HIGHWAY TO AP CARTER HIGHWAY**



US 58 (Bristol Highway) Wadlow Gap Highway to AP Carter Highway

Existing Conditions Report

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Table of Contents

Chapter 1: Needs Evaluation and Diagnosis.....	4
Introduction.....	5
Background.....	5
Methodology	6
Study Area	6
Underway Projects, Previous Studies, and Planning Documents	9
Traffic Operations and Accessibility:	9
Traffic Data	9
Measures of Effectiveness.....	10
Traffic Operations Analysis Results	10
Other Operations and Access VTrans Needs.....	11
Safety and Reliability.....	13
Safety Analysis Results	13
VDOT Safety Screening	13
Crash Analysis.....	13
FHWA Screening Tool for Equity Analysis of Projects (STEAP).....	19
Decision to Address Study Corridor via Systemic Programs	19

APPENDICES

APPENDIX A – 2023 TRAFFIC COUNT DATA COLLECTION
APPENDIX B – SYNCHRO/SIMTRAFFIC REPORTS – EXISTING 2023 CONDITIONS
APPENDIX C – FHWA STEAP REPORT



Chapter 1:

Needs Evaluation and Diagnosis

Introduction

Project Pipeline is a performance-based planning program to identify cost-effective solutions to multimodal transportation needs in Virginia. Through this planning process, projects and solutions may be considered for funding through programs, including SMART SCALE, revenue sharing, interstate funding, and others. Visit the Project Pipeline webpage for additional information: vaprojectpipeline.org.

This study focuses on concepts targeting identified needs including congestion mitigation, safety improvement, pedestrian and bicycle infrastructure along the corridor, and transit access. The objectives of Project Pipeline are shown below in **Figure 1**.

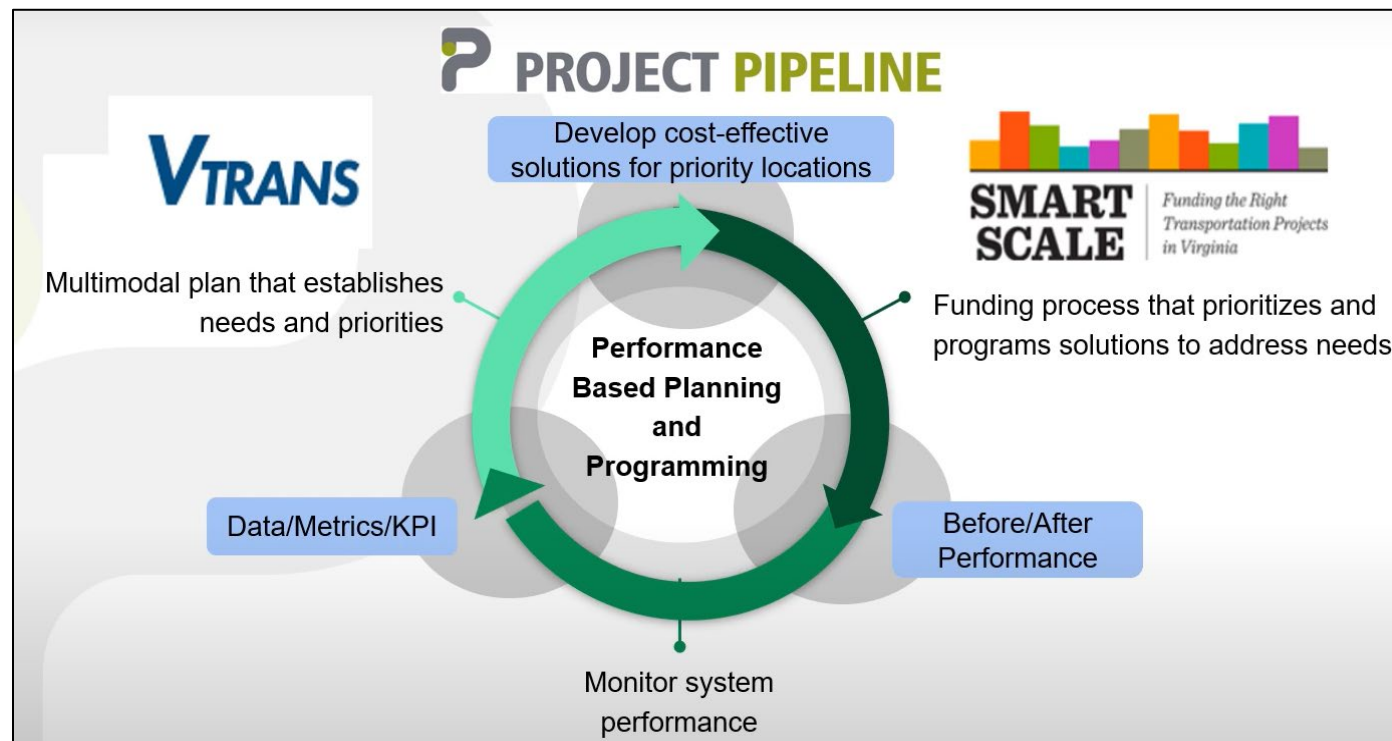









Figure 1: Project Pipeline Objectives

Background

The Office of Intermodal Planning and Investment (OIPI) prepared the VTrans Virginia's statewide transportation plan for the Commonwealth Transportation Board (CTB) in which mid-term needs (0 - 10 years) were identified for different categories listed in **Table 1**. This study focuses on addressing needs identified in VTrans, and those previously identified by the localities.

Table 1: List of VTrans Needs

VTrans Needs	
	Safety Improvement
	Transportation Demand Management
	Congestion Mitigation
	Pedestrian Safety Improvement
	Transit Access
	Capacity Preservation
	Bicycle Access

Methodology

The study is broken down into three phases. Phase 1 involves problem diagnosis and brainstorming of alternatives, Phase 2 is the detailed evaluation of alternatives and developed of initial concepts, and Phase 3 is the finalization of the preferred alternative in regard to design concept and cost estimate. Details on methods and solutions for each study phase are outlined below in **Figure 2**.

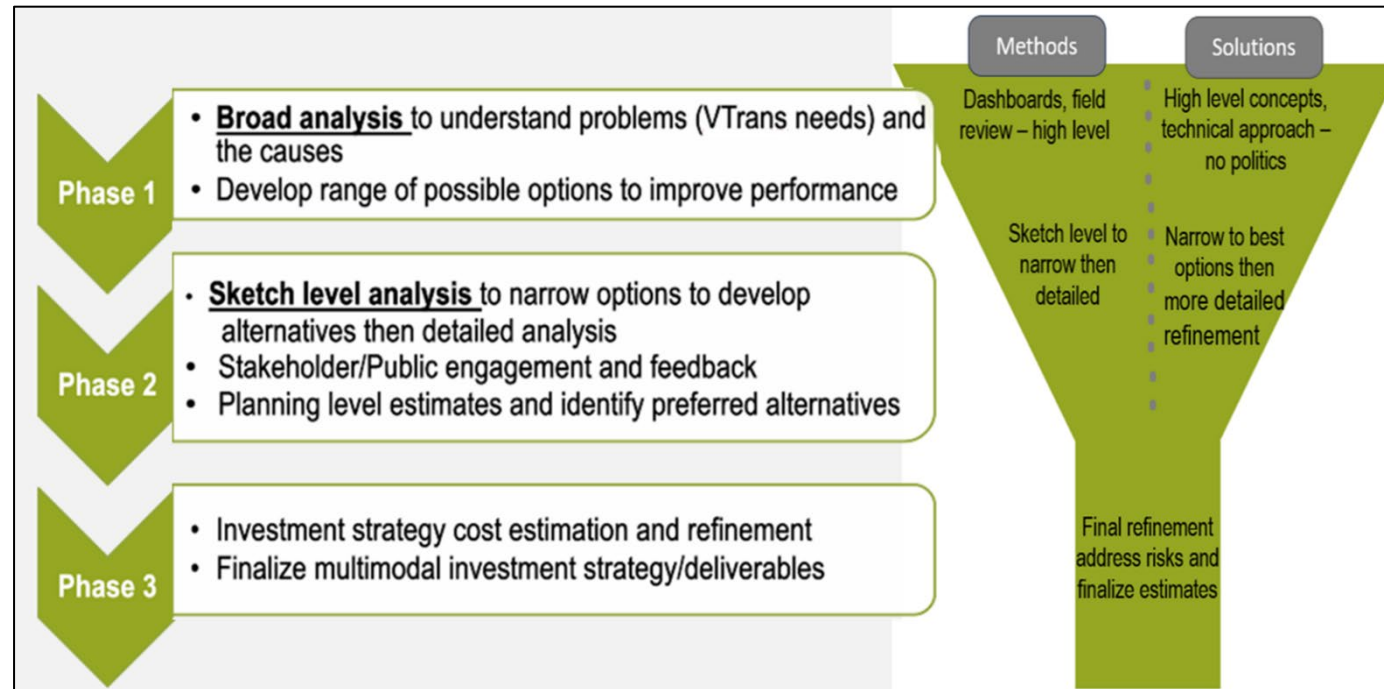


Figure 2: Study Phase Methods and Solutions

The study team is also broken down into three teams with each team simultaneously working on different areas of the study. Team 1 focuses on Traffic Operations, Capacity, and Access, Team 2 focuses on Road Reliability and Safety, while Team 3 focuses on Rail, Transit, and Transportation Demand Management (TDM), as shown in **Figure 3**. The following details the focus area of study for each team:

- Team 1 – Identify operation and access needs by conducting future traffic demand volume forecasts and performing operational analysis of future conditions using Synchro/SimTraffic. Evaluate operational mitigations such as geometric modifications, access management improvements, and installation of facilities for pedestrians and bicycles.
- Team 2 – Identify safety needs with respect to vehicles, pedestrians, and cyclists by evaluating existing roadway conditions as well as crash patterns and crash hot spot locations based on the most recent five-year crash history obtained from the Virginia Department of Transportation (VDOT) Crash Analysis Tool. Recommend safety improvement options through geometric

modifications, access management improvements, and installation of facilities for pedestrians and bicycles.

- Team 3 – Identify needs with respect to rail, transit, and TDM by reviewing existing rail and transit routes and future traffic demand volume forecasts. Consider improvements that would enhance transit ridership and shift mode choice away from single-occupancy vehicles.

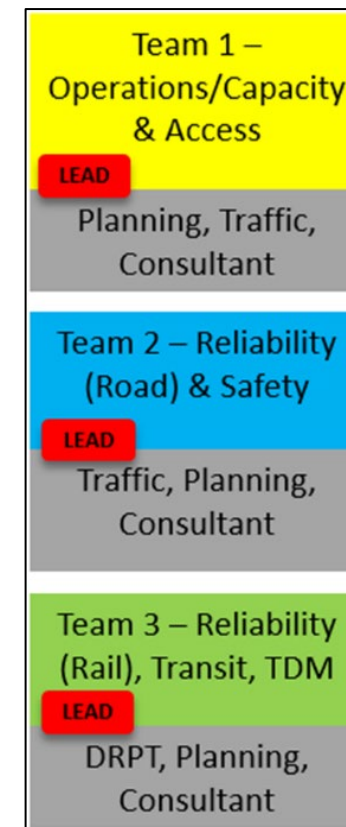


Figure 3: Study Team and Focus Area of Study

Study Area

The US 58 (Bristol Highway) study corridor from Wadlow Gap Highway to AP Carter Highway is located in Scott County, Virginia. The 5-mile US 58 corridor is classified as a rural principal arterial road on the Corridors of Statewide Significance (CoSS) within the study area. The facility is a two-lane undivided road with a posted speed limit of 55 MPH. There are no signalized intersections along the corridor. A map detailing the general location of the US 58 study area is shown below in **Figure 4**.

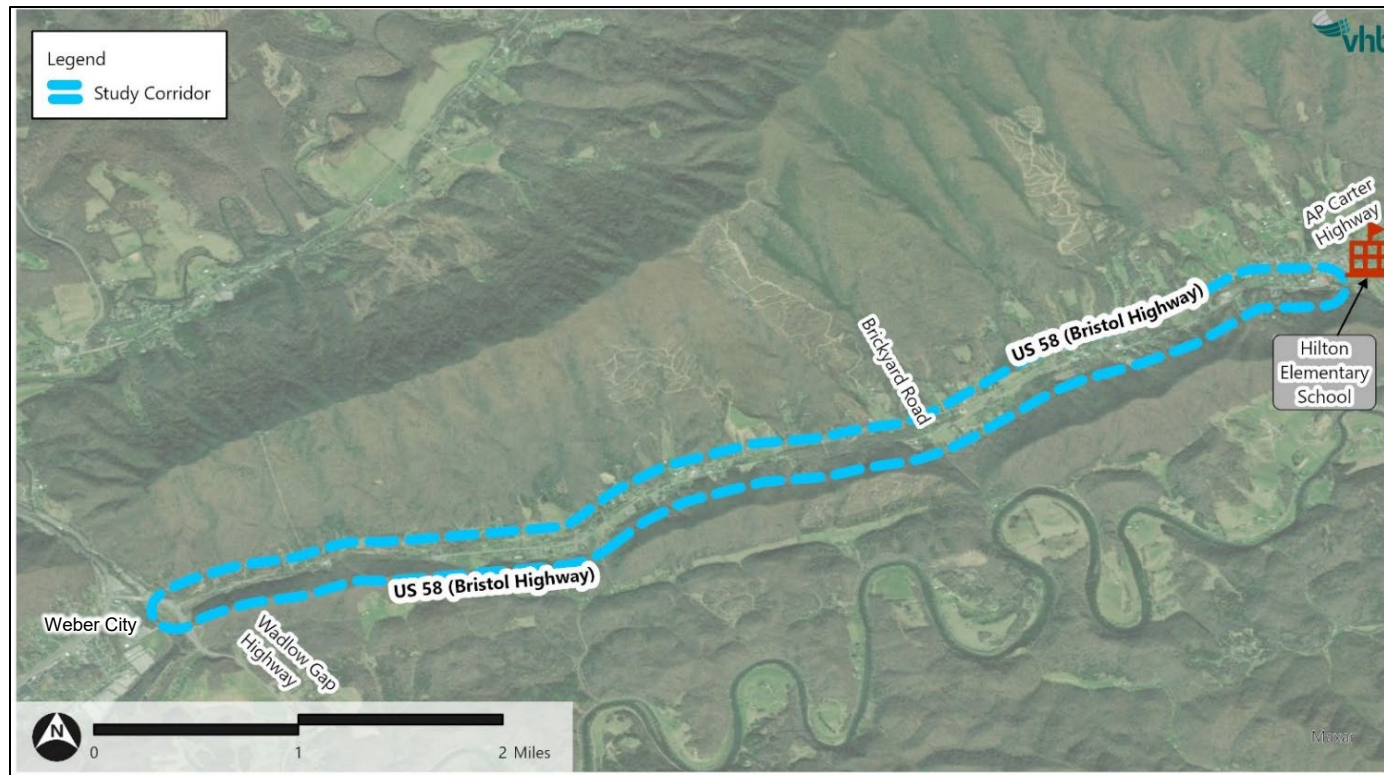


Figure 4: US 58 (Bristol Highway) Study Area Map

VTrans is Virginia’s statewide transportation plan. It identifies and prioritizes locations with transportation needs using data-informed transparent processes. The policy for identifying VTrans mid-term needs establishes multimodal need categories that correspond to the Commonwealth Transportation Board-adopted VTrans visions, goals, and objectives.¹ Each need category has one or more performance measures and thresholds to identify one or more needs. Visit the VTrans policy guide for additional information: https://vtrans.org/resources/VTrans_Policy_Guide_v6.pdf.

The mid-term needs, as identified in VTrans, for the US 58 study corridor were identified as ‘Very High’ for one need area, ‘High’ for one need area, and ‘Low’ for three need areas, and “None” for the rest of the need areas, as presented in **Table 2**. These VTrans mid-term needs are prioritized on a tier from 1 to 4, with 1 being the most critical and 4 being the least critical. The segments ranked as “Priority 1” represent those with multiple categories identified as high in need.

Figure 5 presents a map of the study area with 2019 VTrans mid-term needs prioritized for district attention. As can be seen in the figure, there are Priority 2 and 3 needs throughout the study corridor.

Each VTrans need present on the US 58 (Bristol Highway) corridor (as identified in Table 2) is individually shown in **Table 3**. This facilitates the identification of specific need locations along the corridor.

Table 2: VTrans Needs in Study Area

VTrans 2019 Mid-Term Need	District Priority*
Congestion	None
Reliability	None
Transit Access for Equity Emphasis Areas	None
Transit Access to Activity Centers	Low
Pedestrian Access to Activity Centers	None
Bicycle Access to Activity Centers	High
Access to Industrial & Economic Development Areas	None
Road Safety	Low
Capacity Preservation	Very High
Transportation Demand Management (TDM)	Low
Pedestrian Safety	None

*Max priority within study area

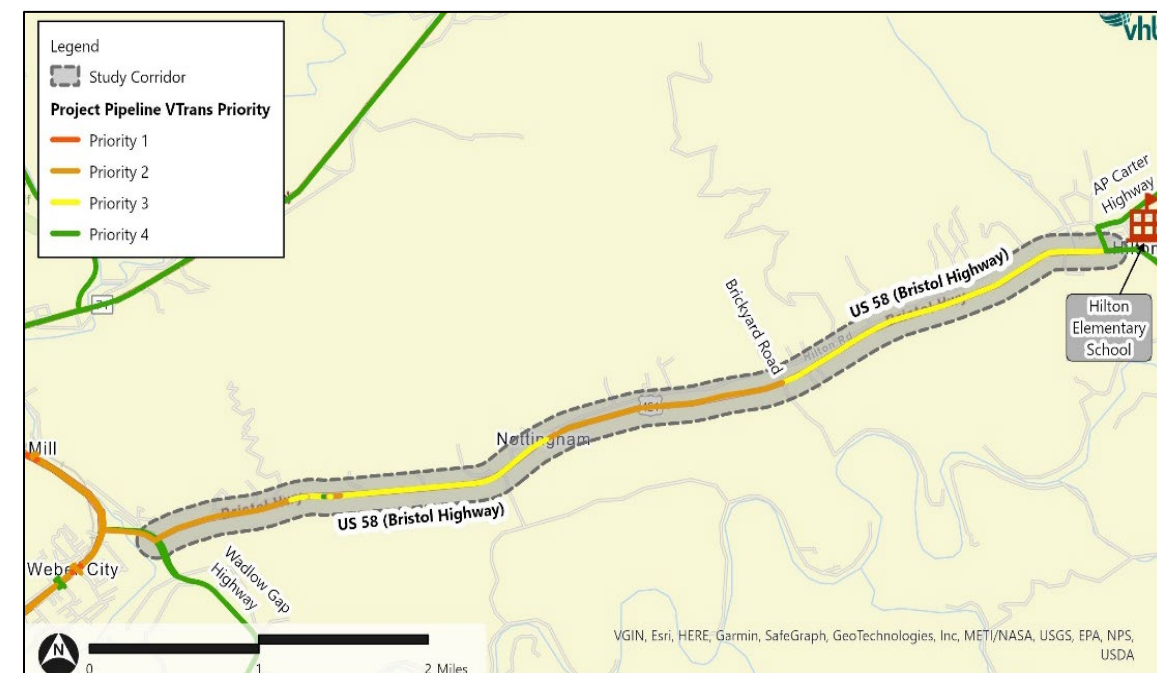
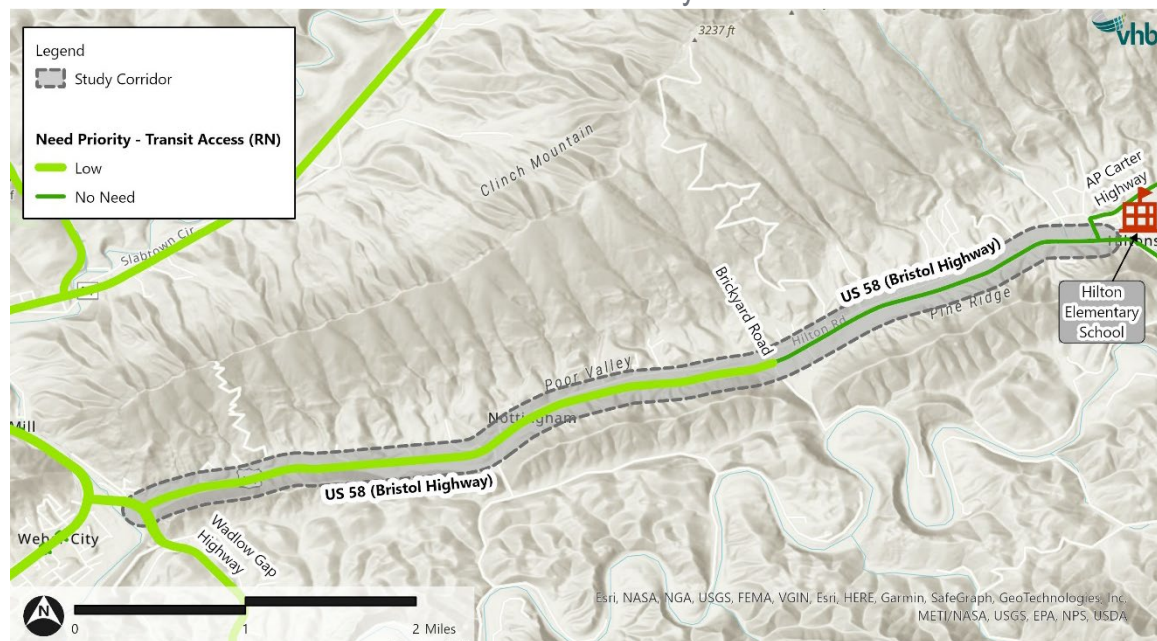


Figure 5: 2019 VTrans Prioritized Mid-term Needs in the Study Area

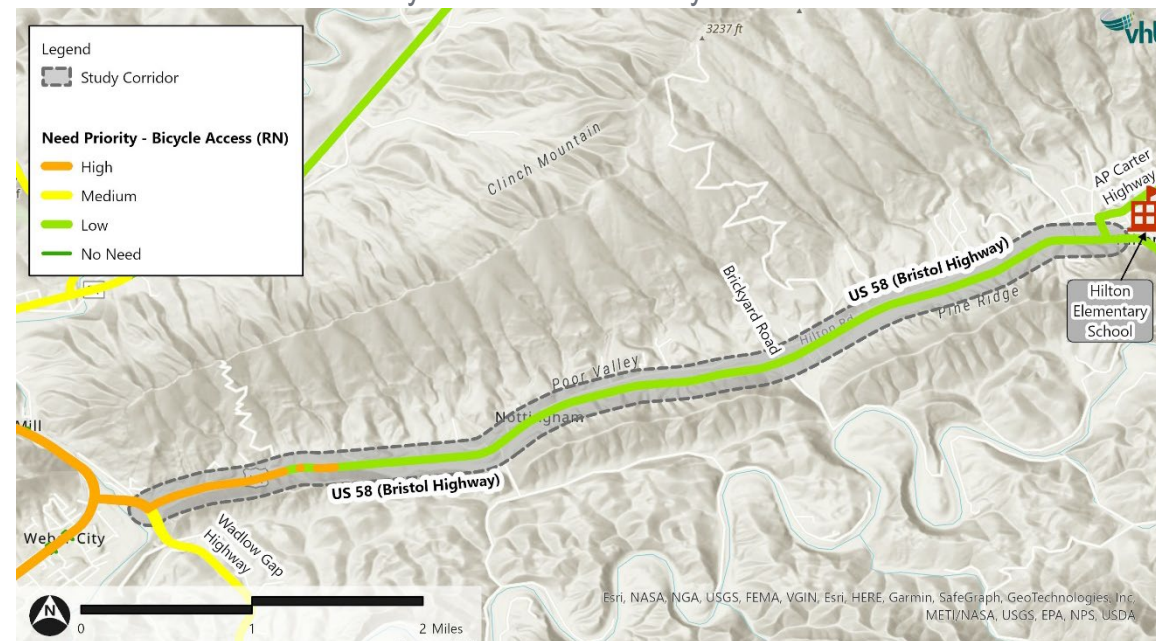
¹ Commonwealth Transportation Board, Actions to Approve the 2019 VTrans Vision, Goals, Objectives, Guiding Principles and the 2019 Mid-term Needs Identification Methodology and Accept the 2019 Mid-term Needs, January 15, 2020

Table 3: VTrans Needs in Study Area

Transit Access to Activity Centers



Bicycle Access to Activity Centers



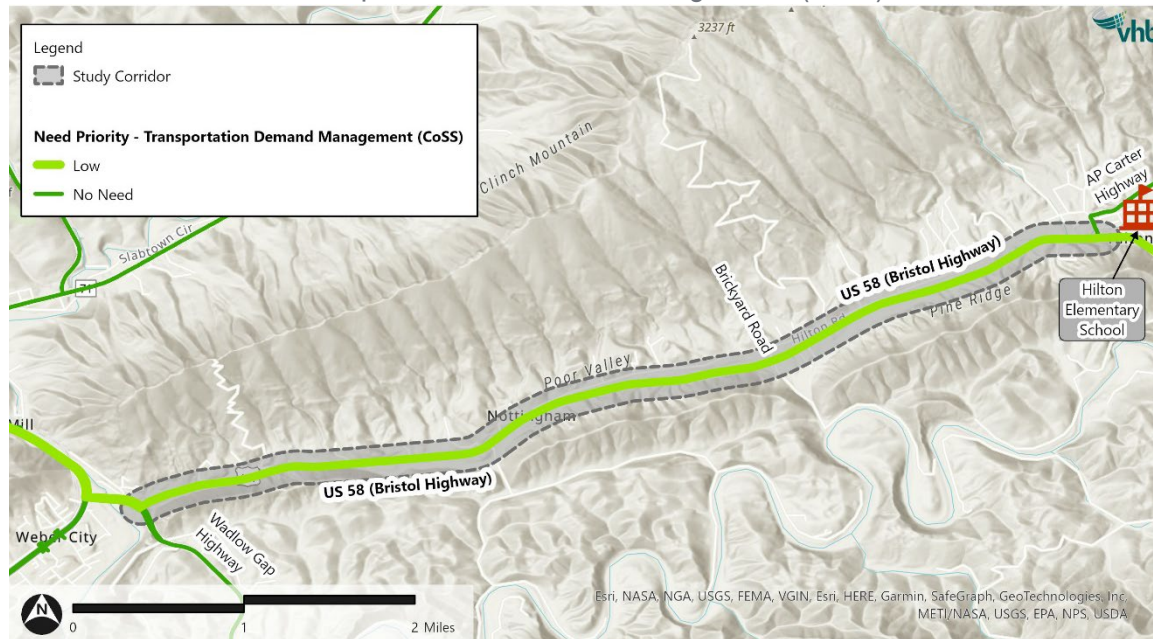
Road Safety



Capacity Preservation



Table 4: VTrans Needs in Study Area - Continued
Transportation Demand Management (TDM)



Underway Projects, Previous Studies, and Planning Documents

Bristol District has been awarded funding through VDOT's Highway Safety Improvement Program (HSIP) to install systemic countermeasures on two-lane rural roads throughout the district. The US 58 study corridor is being evaluated for potential countermeasure implementation through that effort. Although the funding is not guaranteed to be used for this corridor as it is a single allotment for all two-lane rural roads in the district, the systemic countermeasures could address safety issues seen along this corridor.

There are no additional projects, recent previous studies, or relevant planning documents to discuss along the study corridor.

Traffic Operations and Accessibility:

Initial diagnosis of the traffic operations and accessibility issues along the US 58 corridor was completed via traffic count data, field and aerial imagery review, and geospatial analysis.

Traffic Data

Traffic volume data (i.e., vehicle turning movement counts and 72-hours of volume and speed counts at two locations) was collected in May 2023 for the Pipeline Study. Peak hour turning movement counts and the raw traffic volume data are provided in **Appendix A**. VDOT's 2021 Average Annual Daily Traffic (AADT) for the US 58 study corridor is reported as follows:

- Wadlow Gap (SR 224) to AP Carter Highway: 2,900 Vehicles per Day (VPD)

The 72 hours of collected volume and speed data were graphed to evaluate the temporal distribution over the data collection period. **Figure 6** shows the US 58 volume and speed distribution for the data collected between Jayne Hill Circle and Scout Camp Lane, and **Figure 7** shows the US 58 volume and speed distribution for the data collected between the Solid Waste Center and Derby Drive. In both figures, the 15-minute vehicle volume is plotted on the left vertical axis and the mean speed (MPH) is plotted on the right vertical axis. The figures show that the corridor has a highly concentrated volume peak in the morning whereas the afternoon peak is more temporarily distributed. The temporal speed distributions are largely consistent throughout the data collection period.

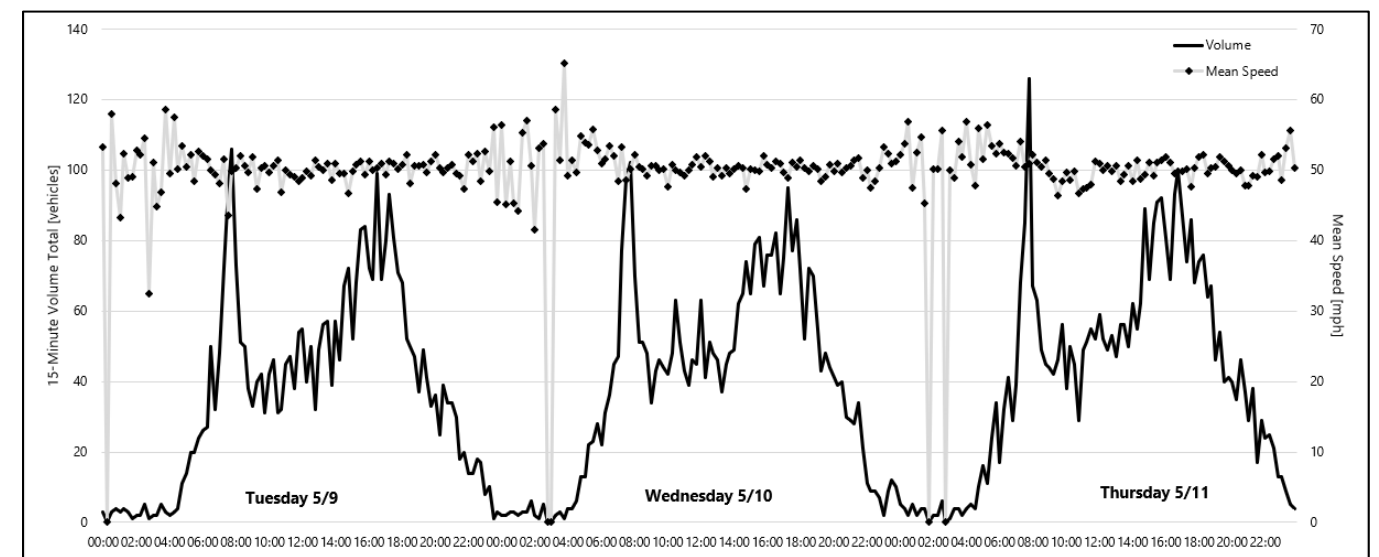


Figure 6: 72-Hour Volume and Speed Distribution on US 58 between Jayne Hill Circle and Scout Camp Lane

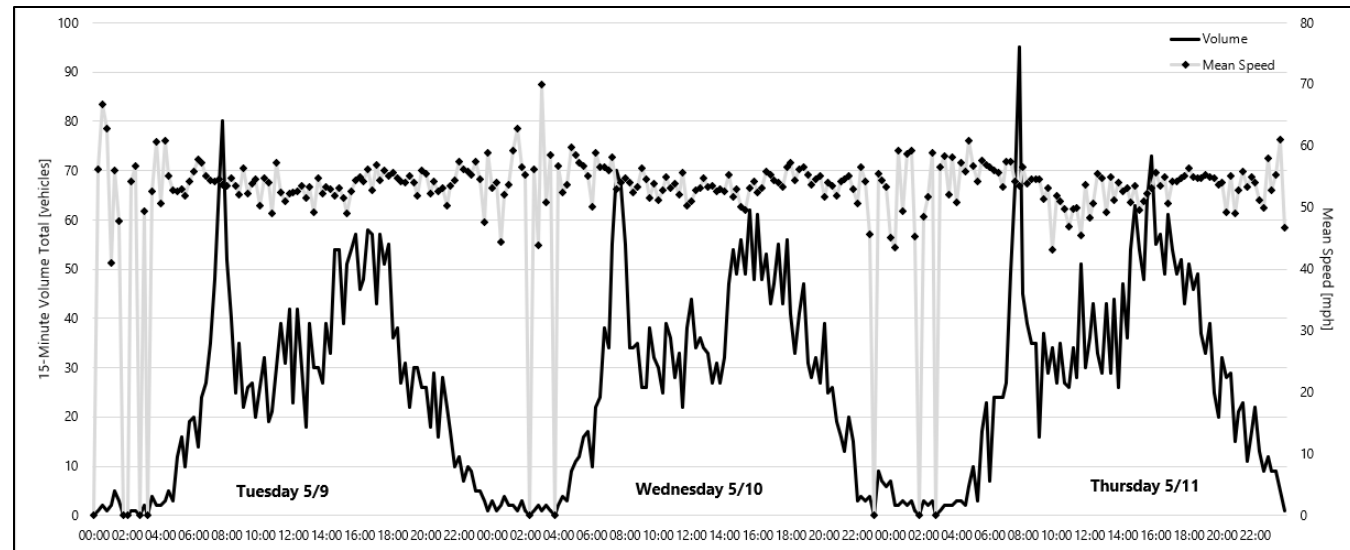


Figure 7: 72-Hour Volume and Speed Distribution on US 58 between the Solid Waste Center and Derby Lane

Table 5 presents volume and speed statistics derived from the 72-hour data collection, including average daily traffic, mean speed, 85th percentile speed, percent of traffic traveling above the speed limit, and vehicle fleet composition. These statistics reveal that the west end of the study corridor carries nearly 50% more daily traffic than the east end of the corridor, there is not a significant speeding issue on the corridor (due to the 85th percentile speed not exceeding 5 MPH above the posted speed limit), and there is a relatively insignificant quantity of truck traffic on the corridor.

Table 5: Speed and Volume Composition

5/7 to 5/9 Data Collection	Average Daily Traffic (ADT)	Mean Speed (SL ¹ = 55 mph)	85 th Percentile Speed (SL = 55 mph)	Speed Notes (% of Traffic)	Vehicle Composition
Between Jayne Hill Circle and Scout Camp Lane	3,715	50.23 mph	56.01 mph	53.8% > SL of 55 mph 20.1% > SL + 5 mph 3.8% > SL + 10 mph	97% Cars 2% Trucks 1% Motorcycles
Between Solid Waste Center and Derby Drive	2,514	54.30 mph	59.74 mph	44.5% > SL of 55 mph 14.0% > SL + 5 mph 2.6% > SL + 10 mph	96% Cars 3% Trucks 1% Motorcycles

¹SL = Speed Limit

Measures of Effectiveness

There are many measures of effectiveness (MOE) in traffic operations analysis to quantify operational and accessibility metrics and provide a basis for evaluating the performance of a transportation network. A summary of the MOEs evaluated for the study corridor during the Phase 1 analysis is presented below:

- Intersection Operations Metrics (Computed in Synchro/SimTraffic)
 - Control Delay (measured in seconds per vehicle – sec/veh)
 - Level of Service (LOS)
 - Maximum Queue Length (measured in feet – ft)

Traffic Operations Analysis Results

In Phase 1, a traffic operational analysis was performed using Synchro 11 software for the intersections along the US 58 corridor. Synchro is a traffic operations software package that is based upon *Highway Capacity Manual* (HCM) calculations. Utilized inputs and analysis methodologies are consistent with the VDOT *Traffic Operations and Safety Analysis Manual (TOSAM)* guidelines. AM and PM peak hour analyses were performed for the peak hour traffic volume dataset.

Table 6 presents the AM and PM peak hour Synchro analysis Level of Service (LOS) summary (reports included in **Appendix B**). As all four intersections are two-way stop-controlled, the LOS/delay for the worst operating approach is reported. As indicated in the table, there is no significant delay at the study intersections on this corridor.

Table 6: Synchro Delay and Level of Service (LOS)

Intersection	Existing AM		Existing PM	
	LOS*	Delay*	LOS*	Delay*
Wadlow Gap and US 58 (Bristol Highway)	B	12.0	B	12.5
Nottingham Road and US 58 (Bristol Highway)	B	12.1	B	11.1
Faust Ford / Brickyard Road and US 58 (Bristol Highway)	A	9.5	A	8.9
A P Carter Highway and US 58 (Bristol Highway)	A	9.3	A	9.0

* LOS and Delay presented shows the highest for an approach at the intersection, not overall

Other Operations and Access VTrans Needs

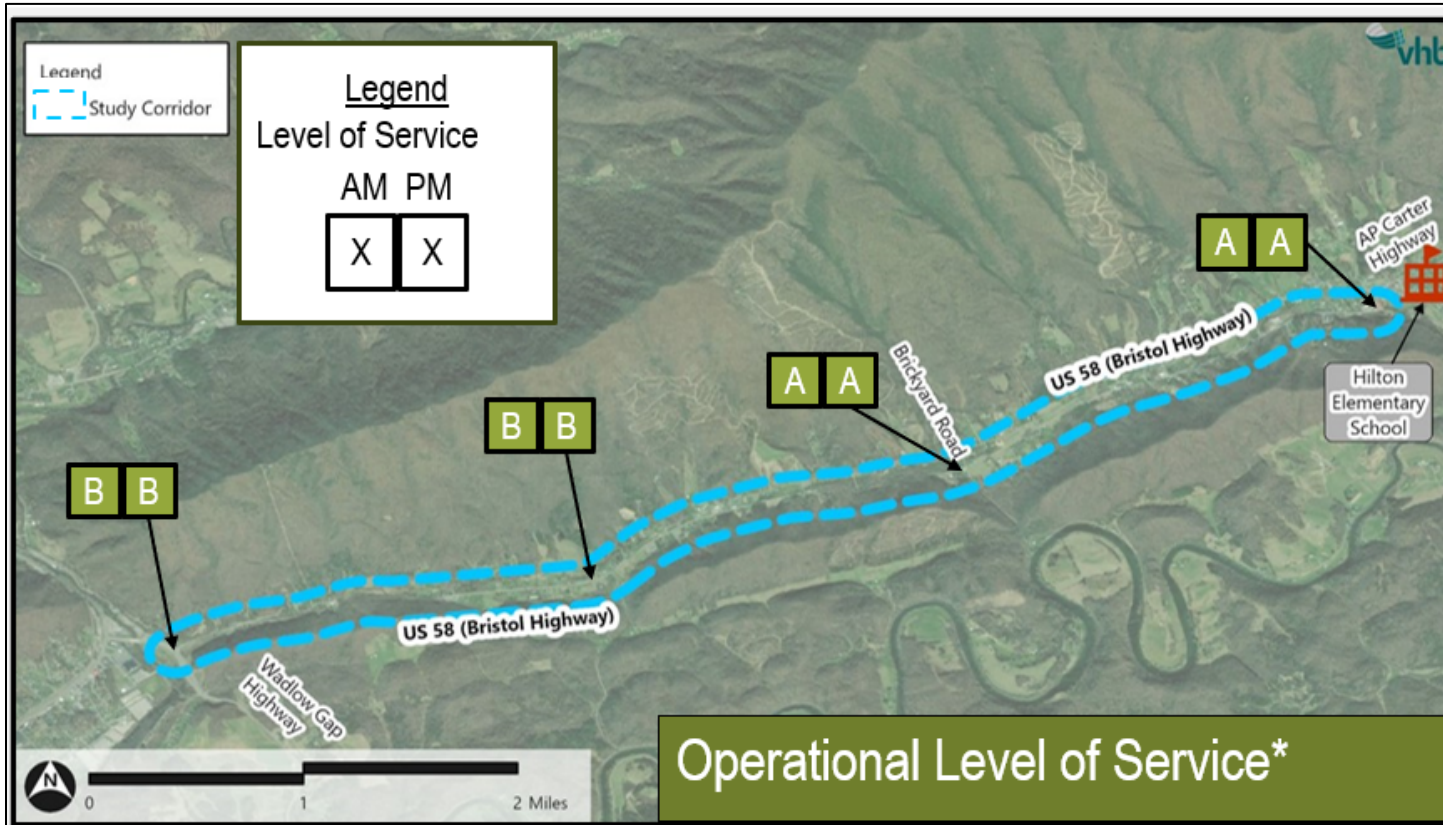
The US 58 study corridor has additional VTrans needs in the areas of accessibility, including transit access to activity center (low priority), bicycle access to activity center (high priority), transportation demand management (TDM) (low priority), and capacity preservation (very high priority). The VTrans needs are identified via a statewide screening process and must be considered through the context of the local corridor. The needs help identify corridors for additional analysis but do not necessarily indicate a transportation need. Each of these four VTrans needs are discussed in more detail in the following section.

The transit and bicycle access needs are both correlated to an activity center, which is a shopping and/or employment hub identified by VTrans. In this instance, the activity center is Gate City. The transit VTrans need was identified based on an analysis indicating that fewer workers are able to reach the activity center within 45 minutes by transit than by private automobile. In Scott County, Mountain Empire Transit operates a demand-based service Monday-Friday 7AM-5PM. The bicycle VTrans need was identified based on a seven-mile commute threshold from the activity center. Given the low-density land use along the US 58 corridor, neither higher frequency transit nor bicycle facilities connecting to Gate City are warranted.

The TDM VTrans need is automatically assigned to non-limited access facilities that are on the Corridors of Statewide Significance (CoSS), such as US 58. This assignment is indicative of the importance of these statewide transportation arteries to moving people and goods. The goal of TDM in general is to convert private automobile trips to carpools or multimodal (transit, walk, bike, etc.). The context of the US 58 study corridor is not conducive to these types of trip conversions.

The capacity preservation VTrans need is automatically assigned to corridors on the Arterial Preservation Network (APN), which is a network of VDOT-maintained roads that function similarly to the interstate system in that they convey people and goods across the state. As such, VDOT has prioritized preserving mobility on these corridors. Mobility can be hindered when there is either recurring congestion or significant safety concerns that could induce non-recurring congestion. As already documented, the recurring operations of this corridor are readily accommodated, so the capacity preservation on this corridor is more correlated to the safety performance.

Figure 8 summarizes the operations and access needs on this corridor.



Operational Level of Service*

*Intersection LOS is not reported for two-way stop control intersection. LOS reported is worse of side-street approach.

72-Hour Volume and Speed Data

Location	Daily Traffic (ADT)	Mean Speed	85 th Percentile Speed	Percent of Traffic 10+ MPH over Speed Limit
Between Jayne Hill Circle and Scout Camp Lane	3,700	50.2 MPH	56.0 MPH	3.8%
Between Solid Waste Center and Derby Drive	2,500	54.3 MPH	59.7 MPH	2.6%

Operations Summary

- The intersection capacity analysis revealed that drivers do not experience significant delay or queuing on any controlled vehicle movements.
- The traffic volumes indicate that the two-lane cross-section has sufficient capacity to accommodate the volume demand.
- The speed data shows that driver speeding is not a significant concern along this corridor as the 85th percentile speed is less than 5 mph above the posted speed limit.
- US 58 is a vital corridor for local and regional capacity preservation; however, the safety and operations existing data does not indicate a need to enhance the existing capacity.

VTrans Operations / Access Needs

NEED	PRIORITY
Transit Access	Low
Bicycle Access	High
Capacity Preservation	Very High
Transportation Demand Management (TDM)	Low

Access Summary

- The transit and bicycle access VTrans Needs are due to the corridor's proximity to Gate City, a VTrans defined Activity Center.
- The characteristics of this corridor (adjacent land use, volumes, cross-section, etc.) do not suggest the need for transit or bicycle improvements along this corridor.

Figure 8: Operations Needs and Diagnosis

Safety and Reliability

VDOT's Crash Analysis Tool was utilized to determine the crash history along the study corridor on US 58 (Bristol Highway). Crash data was collected and analyzed for a five-year period spanning from January 2018 to December 2022. The study team reviewed the crash details within VDOT's Crash Analysis Tool as well as the FR300 crash reports to determine specific trends. The study team also performed geospatial analysis to identify "hot spot" areas for consideration in developing alternative improvement concepts. On the US 58 (Bristol Highway) study corridor, there was no "reliability" VTrans need, so this topic area was not considered. Reliability is defined as the consistency of expected travel time along a corridor; as previously reported, the operations of this corridor are fine.

Safety Analysis Results

VDOT SAFETY SCREENING

Through a systemic analysis methodology that incorporates bicycle/pedestrian crash history, roadway characteristics, proximity to pedestrian generating land uses, and socioeconomic data, VDOT identifies a Pedestrian Safety Action Plan (PSAP) roadway network of high-risk corridors. US 58 (Bristol Highway) within the study area is not a PSAP segment as it has minimal pedestrian activity and risk factors.

VDOT also conducts safety screening analysis at a network level to identify critical hot spots where crashes are statistically overrepresented. A metric called Potential for Safety Improvement (PSI) is computed that identifies locations where actual crashes are overrepresented compared to what would be anticipated for a roadway of those characteristics. The top 100 intersections and segments are then ranked by PSI in each VDOT District. **Figure 9** shows that the US 58 (Bristol Highway) study corridor contains one of the top 100 intersections, but none of the top 100 segments within the Bristol District.

CRASH ANALYSIS

There were 43 total crashes within the study period from January 2018 to December 2022. Out of these crashes there were a higher number of animal crashes, run-off-road, and angle crashes. The crashes within the study area are summarized by type and severity in **Figure 10** however animal crashes are not included. The run-off-road crashes could be attributed to the corridor's horizontal and vertical curvature as well as the speed of drivers. **Figure 11** displays a heat (density) map of all crashes on the corridor; there is a clear cluster at the Wadlow Gap and Bristol Highway intersection. While most crashes only involved property damage, 27% of crashes involved either a fatality or a severe injury. These high-impact crashes are of particular importance in identifying and addressing potential safety concerns.

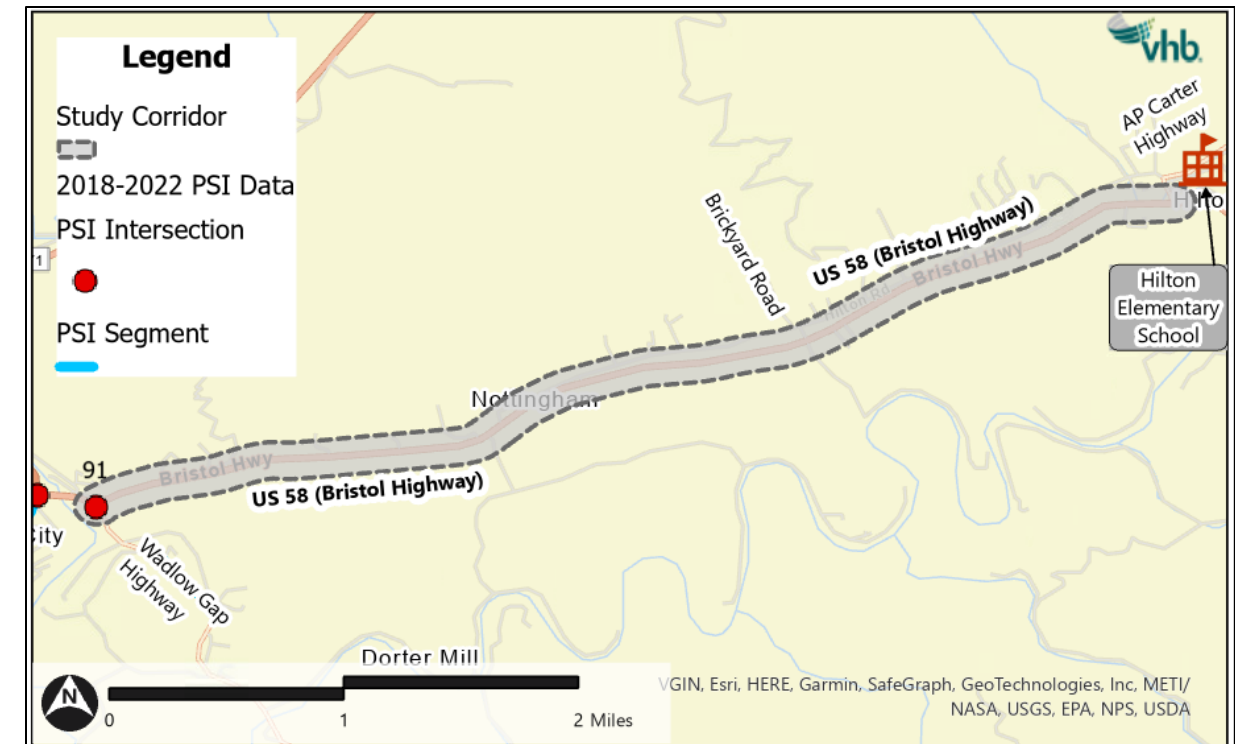


Figure 9: PSI Map of US 58 (Bristol Highway) Corridor

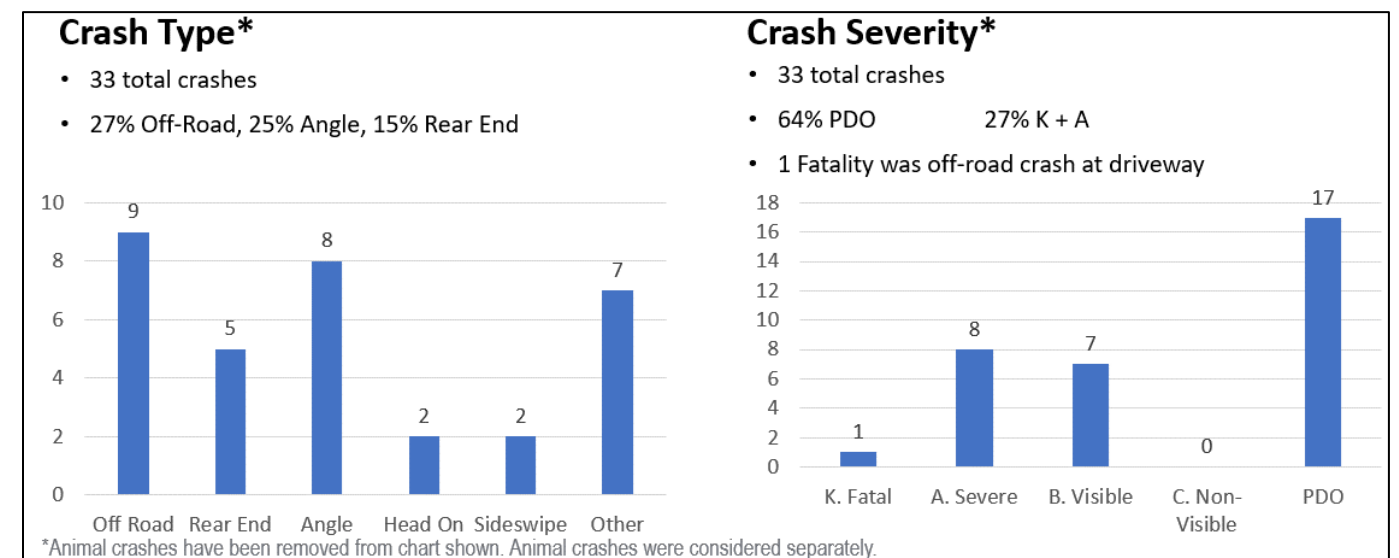


Figure 10: US 58 (Bristol Highway) Crash Statistics

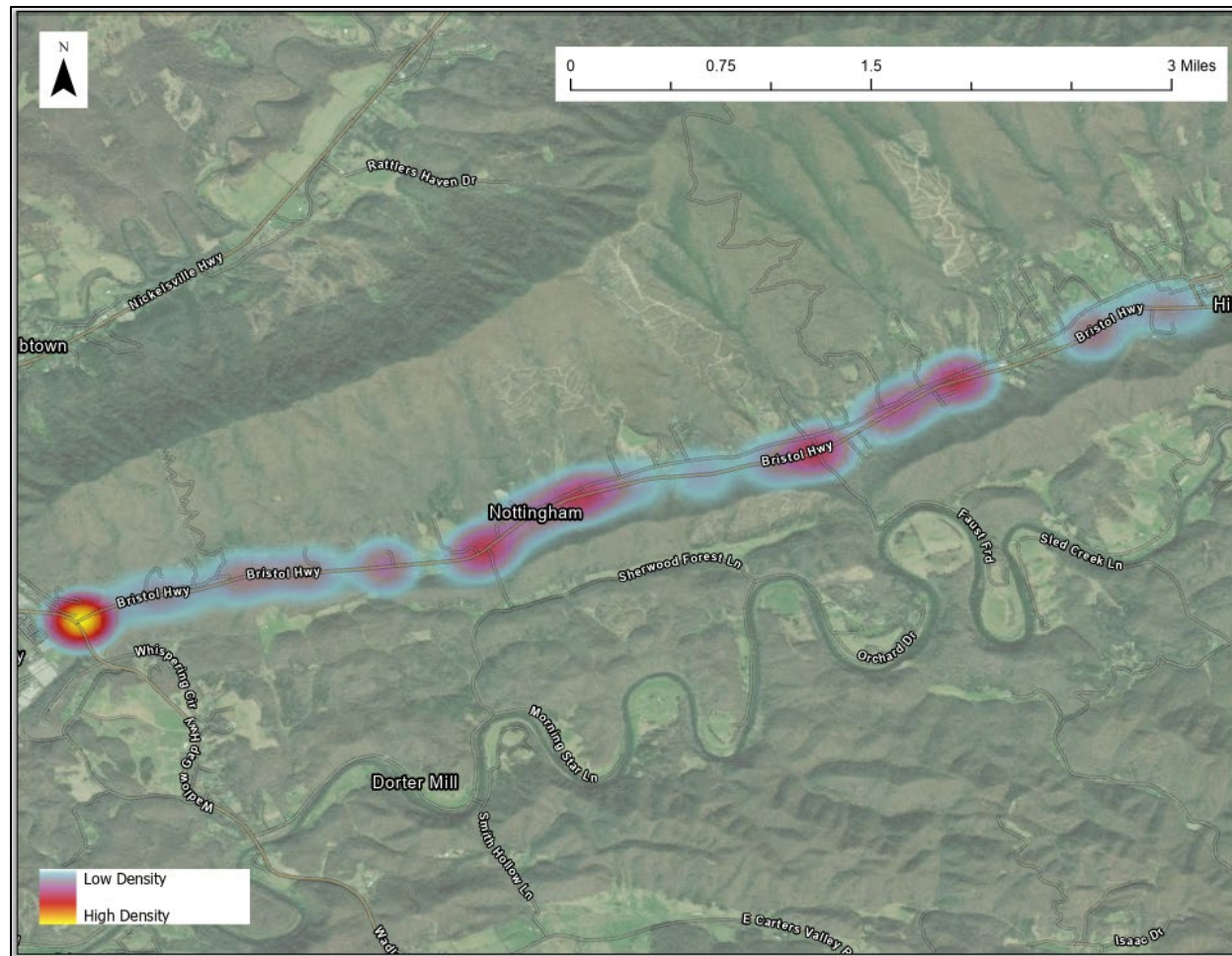


Figure 11: US 58 (Bristol Highway) Crash Heat Map

There were ten reported large animal crashes on the US 58 (Bristol Highway) study corridor, all of which involved deer and were property damage only (PDO) crashes. It is important to note that, according to recent Virginia Transportation Research Council (VTRC) research, the number of actual large animal crashes may be 5 times greater than the reported number of large animal crashes. Most of these animal crashes occurred in dark conditions. **Figure 12** displays a heat (density) map of the animal crashes on the study corridor. The figure shows two locations that have a higher density of animal crashes. The deer crashes were seasonal with 70% of crashes occurring between October-November and another 20% occurring in January. Animal crash patterns such as these are typical of southwest Virginia and the quantity of crashes is not sufficient to warrant specific animal crash countermeasures beyond potential seasonal warning signs.

The crashes in the clustered locations were further studied to look for any patterns and trends in the location or type of crashes. The FR 300 reports as well as the VDOT crash data were used to create collision diagrams that are shown in **Figure 13** through **Figure 15**. The collision diagrams show a pattern

of angle crashes at the Wadlow Gap Highway and US 58 (Bristol Highway) intersection, specifically a conflict between westbound turning vehicles from US 58 (Bristol Highway) and northbound vehicles on VA 224. As seen in **Figure 13**, this intersection is within a curve segment. In the northbound direction, the roadway opens from a single lane to two lanes and is on a downgrade, both of which may encourage speeding. This combination of factors may make it difficult for westbound turning vehicles to appropriately judge a gap in northbound traffic to complete their turning maneuver. As seen in **Figure 14**, the fatality at the Brickyard Road / Faust Road intersection involved a medical event and a roadway departure that could have occurred anywhere along the study corridor or beyond. A review of the crash data at this location does indicate site-specific issues that could be addressed via a capital improvement project.

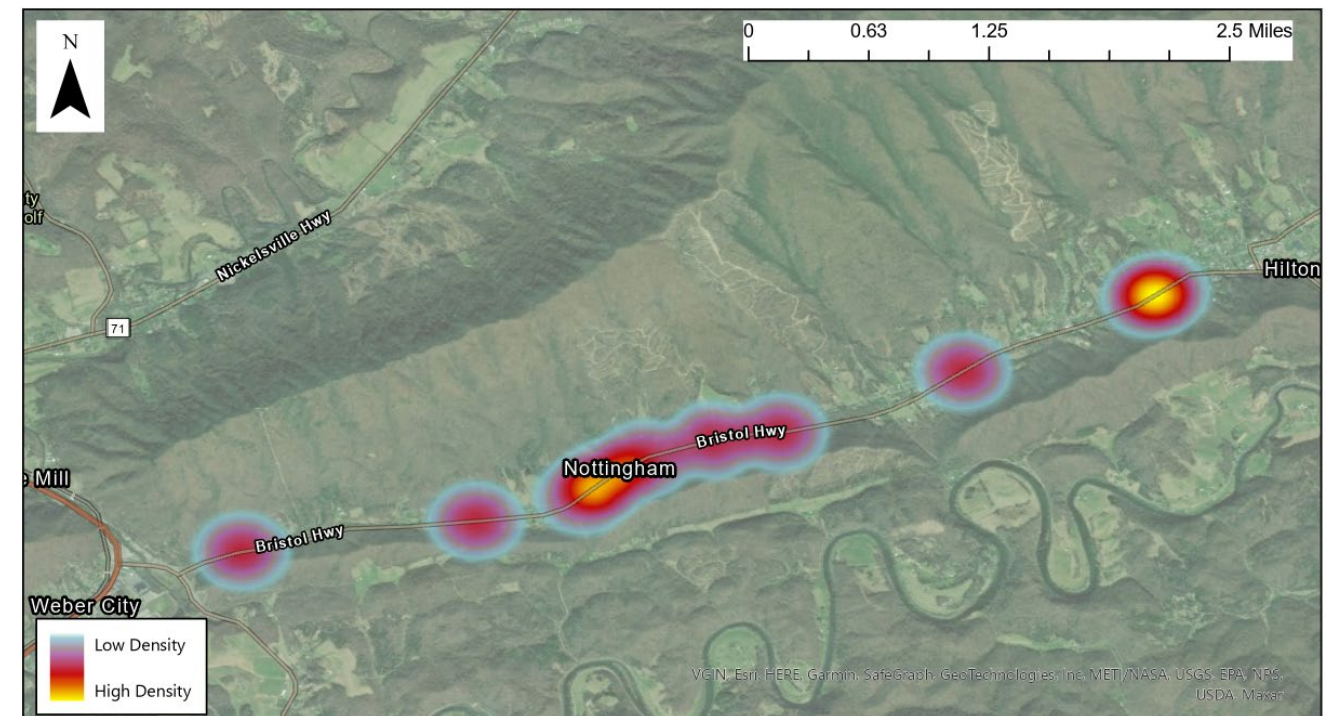


Figure 12: Animal Crashes on US 58 (Bristol Highway)

In summary, the crash patterns on the US 58 study corridor are primarily nighttime animal crashes and run-off-road crashes within horizontal roadway curvature. These are typical crash patterns within Bristol District and Scott County, and a review of the safety data does not indicate significant site-specific issues that could be addressed through site-specific improvement projects. The crash pattern is best addressed by systemic countermeasures such as the Two-Lane Rural Road (TLRR) HSIP program that the US 58 corridor is eligible to receive improvement funding through. This program will be funding run-off-road crash countermeasures such as rumble strips, shoulder improvements, and enhancements to signing and marking.

Figure 16 provides an overview of the safety needs and diagnosis along the study corridor.

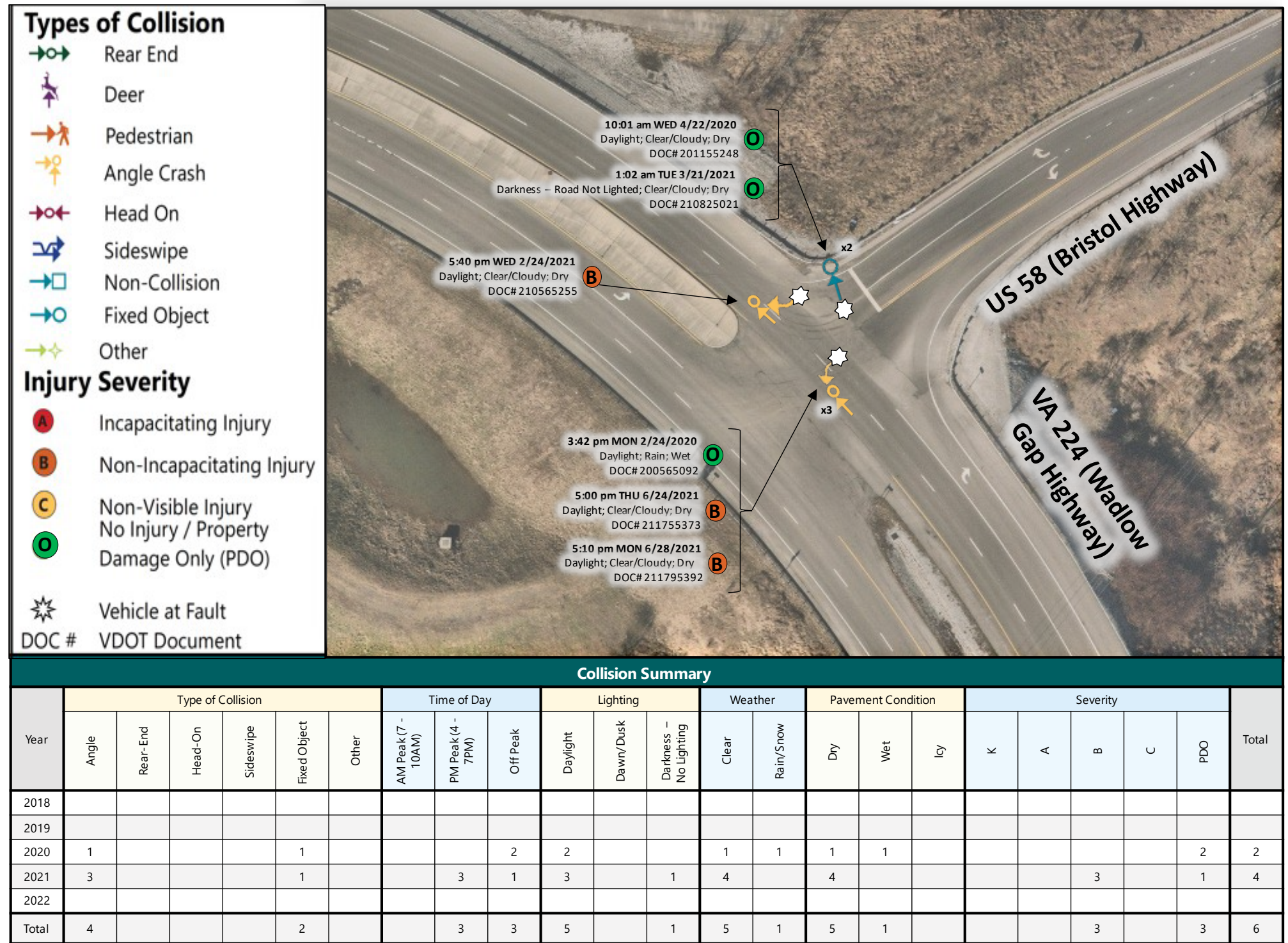


Figure 13: Wadlow Gap Highway and US 58 (Bristol Highway) Collision Diagram

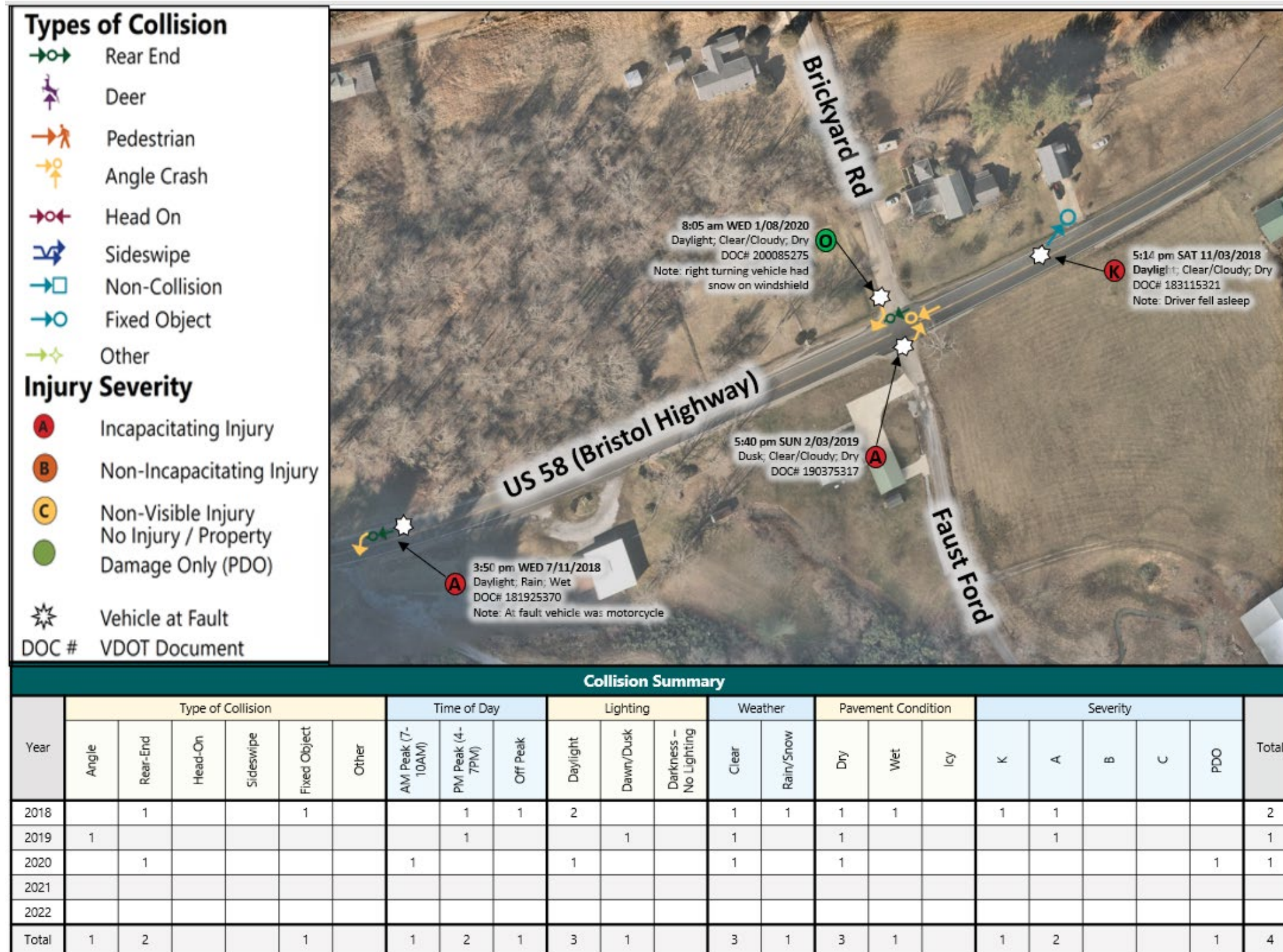


Figure 14: Faust Ford / Brickyard Road and US 58 (Bristol Highway) Collision Diagram

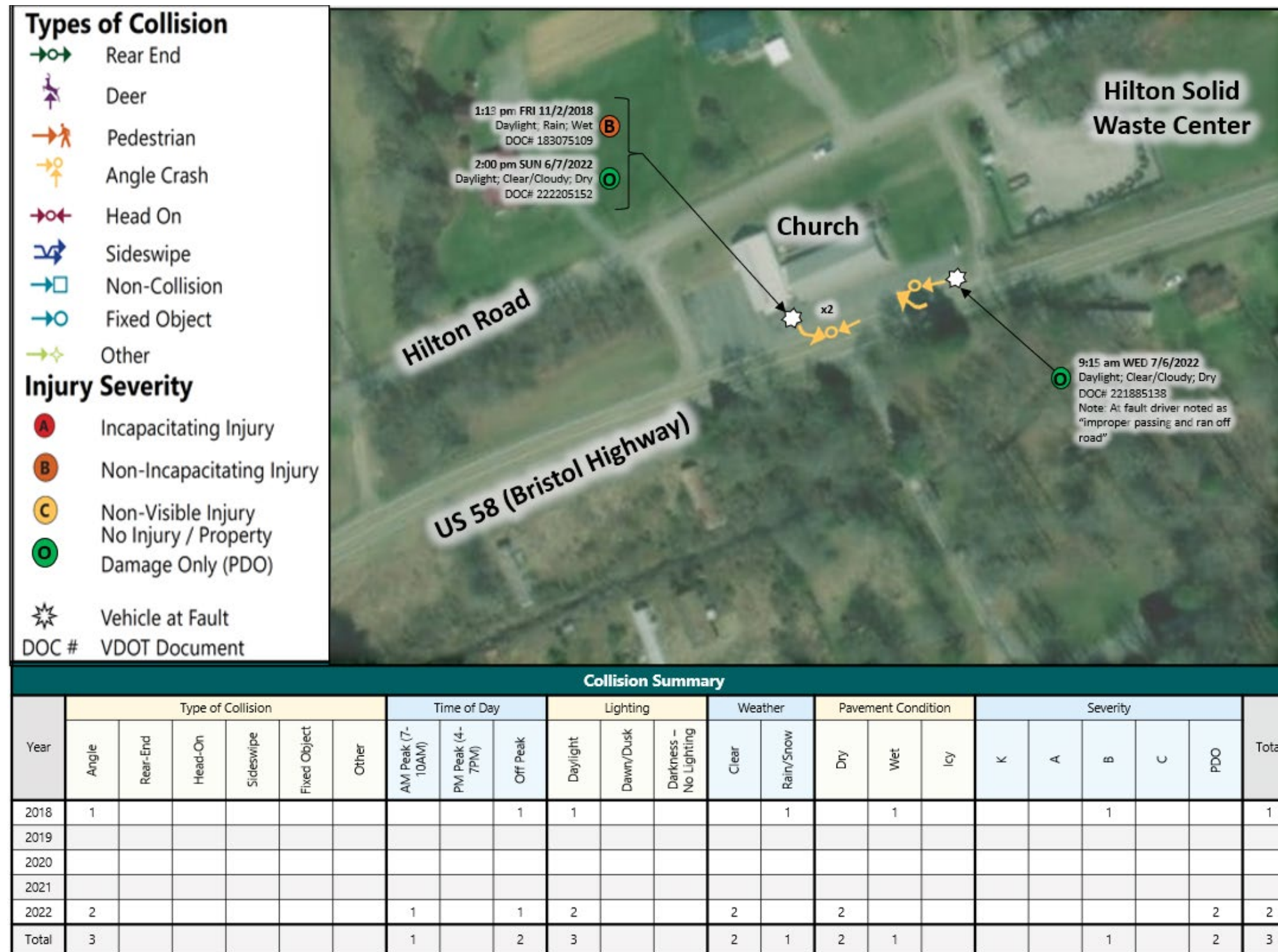
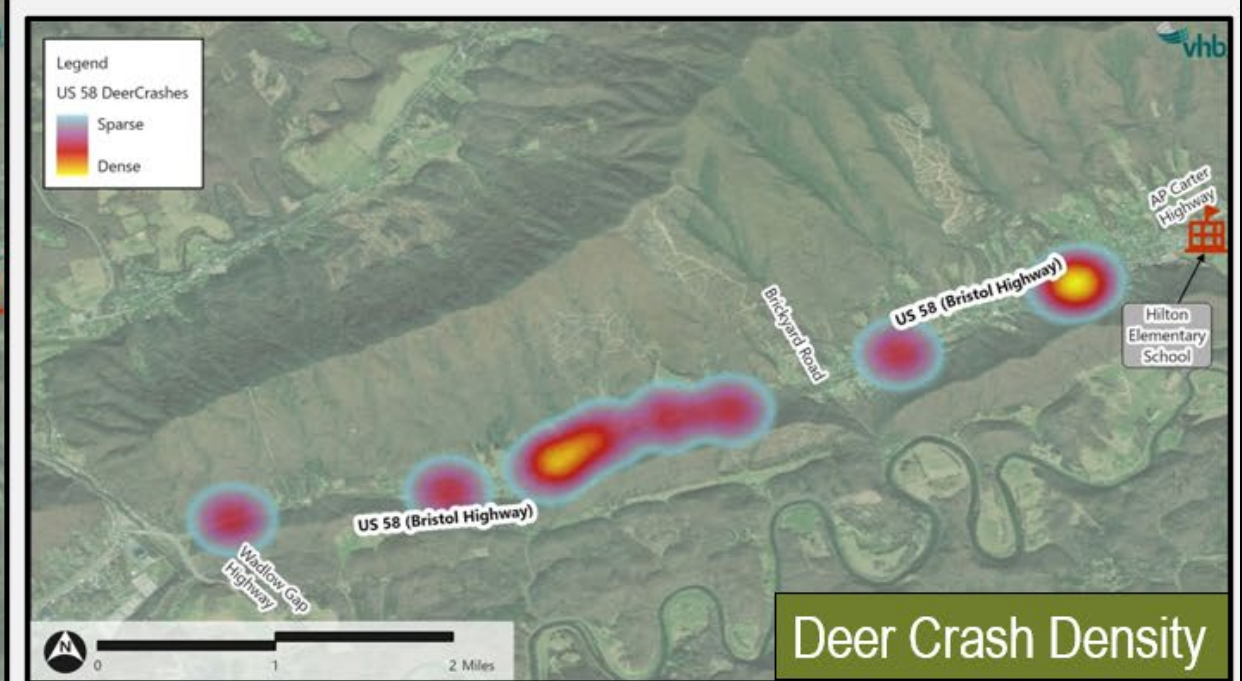
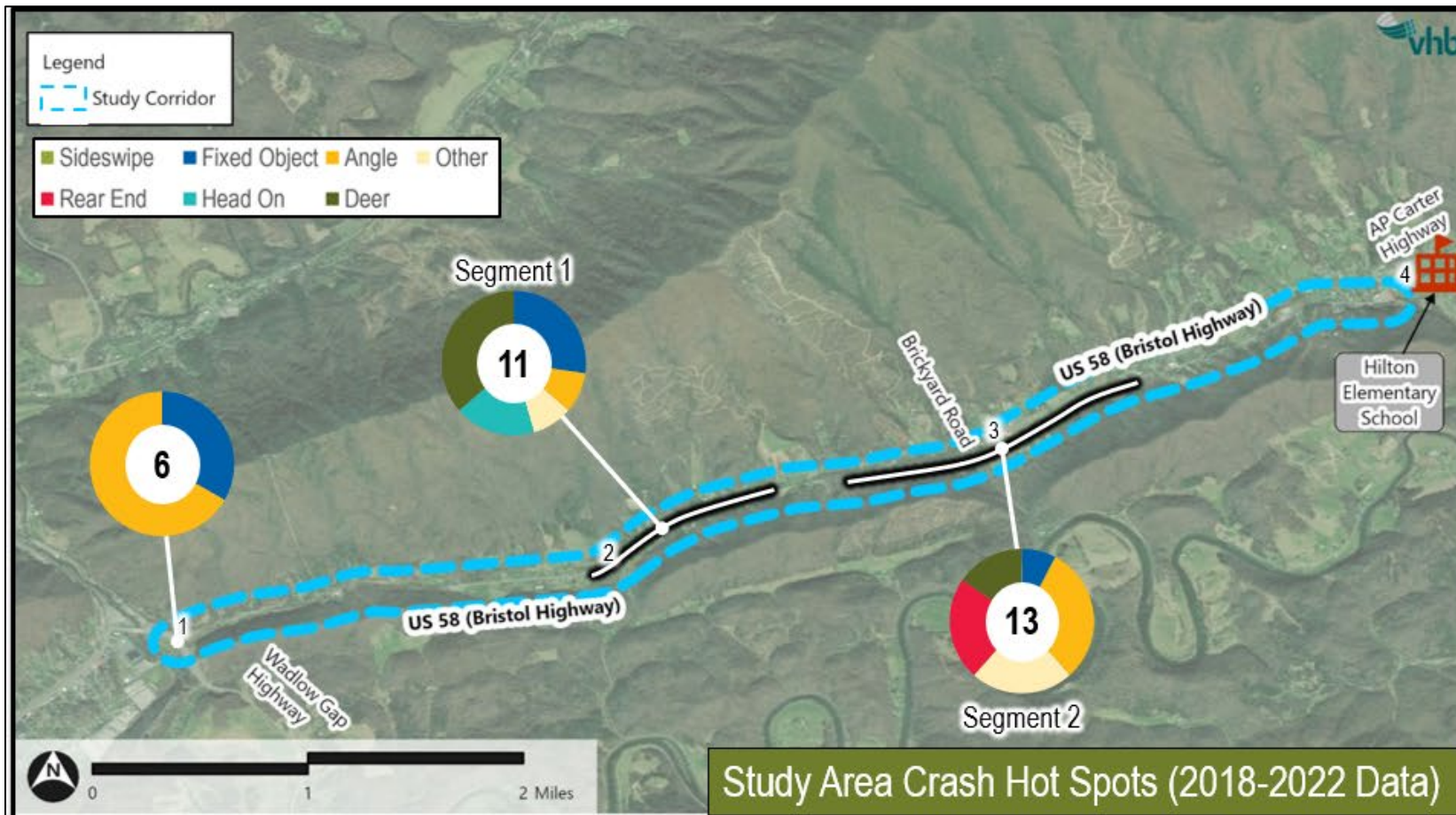


Figure 15: Hilton Solid Waste Center and US 58 (Bristol Highway) Collision Diagram



Safety Summary

- The primary crash pattern along the corridor is lane departure crashes that are primarily located within horizontal curves. This type of crash pattern is typically addressed through low-cost safety countermeasures such as shoulder improvements, rumble strips, signing, and marking.
- Crashes at the intersection of US 58 and Wadlow Gap Highway appear to be partially attributed to the speed of northbound Wadlow Gap Highway vehicles.
- The fatality involved a driver medical event and is not indicative of a site-specific safety concern.
- The deer crashes along the corridor are not concentrated in sufficient quantity or proximity to warrant animal crash countermeasures. While these crashes are largely seasonal (late fall and early winter), this crash pattern exists throughout southwest Virginia.

VTrans Safety / Reliability Needs

NEED	PRIORITY
Road Safety	Low
Capacity Preservation	Very High

VDOT 2018-2022 Crash Data

Hot Spot Intersection / Segment	Crashes by Severity					Total
	K	A	B	C	O	
At Wadlow Gap Highway	0	0	3	0	3	6
Segment 1	0	2	0	0	9	11
Segment 2	1	2	2	0	8	13
Total	1	4	5	0	20	30

K = Fatal Injury; A = Severe Injury; B = Visible Injury; C = Non-visible Injury; O = Property Damage Only

Figure 16: Safety Needs and Diagnosis Summary

FHWA Screening Tool for Equity Analysis of Projects (STEAP)

This screening tool shows the demographic make-up of the population residing within the study area, the city/town, the county, and then all of Virginia. The tool allows you to compare the representation of the population with regard to a demographic characteristic, such as age or household income, within the study area compared to the city/town, county, and all of Virginia. **Figure 17** shows the household incomes present in the study area compared to all of Hiltons, Virginia, all of Scott County and the state of Virginia and **Figure 18** shows the age groups present in the study area compared to Hiltons, Virginia, all of Scott County and the state of Virginia. These figures indicate that there is a larger representation of households with a household income between \$15,000 to \$75,000 in the study area when compared to the households with this income in the rest of the state. Hiltons, Virginia, has a very high representation of households with a household income between \$25,000 to \$35,000. The ages represented in the study area are comparable to the rest of the state, however there is a slightly larger representation of seniors in the study area compared to the rest of the state. **Appendix C** provides the full STEAP analysis results.

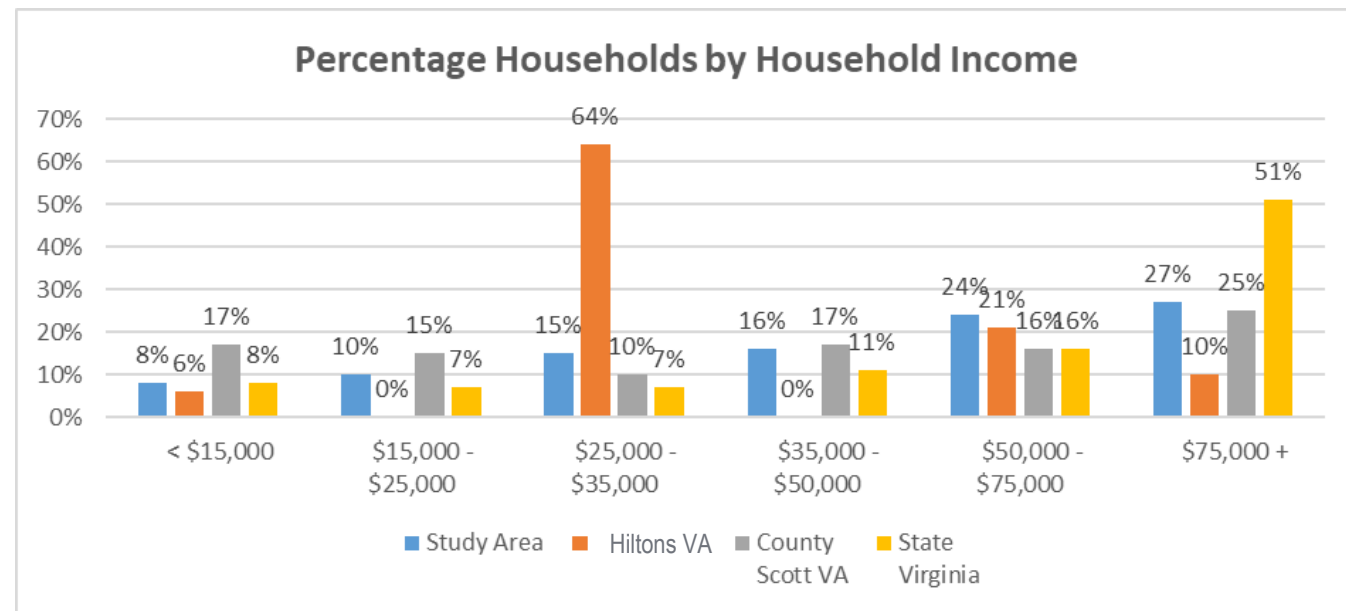


Figure 17: Percent Household by Income

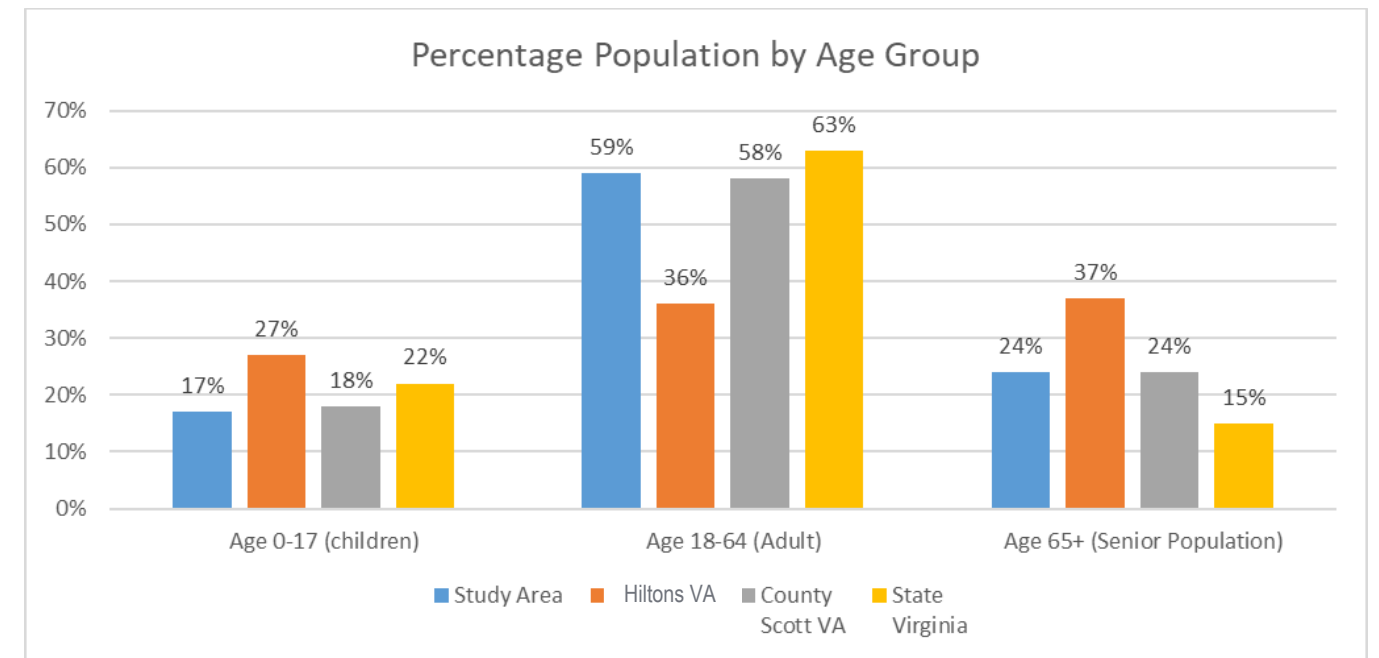


Figure 18: Percent Population by Age

Decision to Address Study Corridor via Systemic Programs

Based on a thorough review of existing conditions data, the study team and VDOT have determined that the needs of the US 58 corridor could be best addressed through systemic safety funding programs such as the two-lane rural road program that has already allocated money to Bristol District to address corridors such as US 58. The operations and safety data do not indicate the need for site-specific improvement projects that would be further evaluated and developed during Phases 2 and 3 of Pipeline. For this reason, VDOT has decided to halt the Pipeline study process on this US 58 corridor and instead prioritize exploring corridor improvements via systemic programs.